

WHAT IS CLAIMED IS:

Claim 1

1. A pretensioner which rotates a spool of a seat belt retractor in a belt winding direction to pretension a seat belt in the event of an emergency, comprising:

- a gas generator;
- a plurality of serial balls which will be accelerated by the gas from the gas generator;
- a path for guiding the balls; and
- a rotational member having a plurality of driving points wherein said balls collide with said driving points so as to apply rotational torque to said rotatable member;

wherein the driving points of said rotational member are partially positioned within said path, and

wherein a space for passage of said balls is defined by said path and said driving points and is narrower than the diameter of said balls.

Claim 2

2. A pretensioner as claimed in claim 1, wherein the surfaces of said balls are applied with lubrication coating.

Claim 3

3. A pretensioner which rotates a spool of a seat belt retractor to pretension a seat belt in the event of an emergency, comprising:

- a gas generator;
- a curved pipe connected to the gas generator and positioned to receive generated gas;
- a plurality of balls which are arranged in series in the pipe to be accelerated by the generated gas in a direction away from the gas generator; and
- a gear surrounded by the pipe and configured to rotate to drive rotation of the spool, the gear having external teeth for receiving at least one of the plurality of balls;

wherein the pipe includes an opening configured to permit the balls to contact the gear;

wherein the pretensioner is configured so that a wall of the pipe opposite the opening is elastically deformed by at least one of the balls during rotation of the gear.

4. The pretensioner of claim 3, wherein an interior surface of the pipe is coated with lubricant.

5. The pretensioner of claim 3, wherein at least one of the balls is coated with a lubricant.

6. A pretensioner which rotates a spool of a seat belt retractor in a belt winding direction to pretension a seat belt, comprising::

a plurality of balls positioned in a pipe connected to a gas generator; a rotatable gear having external teeth;

wherein the pretensioner is configured so that when generated gas enters the pipe the balls are accelerated through a space between the rotating gear and a portion of the pipe containing an opening;

wherein the space is configured so that as the balls move through the space the balls contact the external teeth of the gear to rotate the gear; and

wherein a width of the space is less than the diameter of at least one of the balls, thereby requiring a portion of the pretensioner to deform in order to allow the balls to pass through the space.

7. The pretensioner of claim 6, wherein the pipe is configured to elastically deform during movement of the balls through the space.

8. The pretensioner of claim 6, wherein the inner surface of the pipe is coated with lubricant.

9. The pretensioner of claim 6, wherein at least one of the balls is coated with lubricant.

10. The pretensioner of claim 6, wherein the gear includes internal teeth that are configured to engage the spool.

11. The pretensioner of claim 6, wherein the gear is configured to move into engagement with the spool when the external teeth are moved by the balls.

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